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# **Health information systems and accountability in Kenya: A structuration theory perspective**

## **Abstract**

Health information systems (HIS) in most low- and middle-income countries (LMICs) have been often implemented under the international pressure of accounting for health care investments. The idea behind robust and efficient HIS is that health information can allow for better planning and monitoring of the health service, which may translate into better health outcomes. Yet, the use of HIS as accountability tools has often been criticized as being counterproductive by making health information more meaningful to national governments and international agencies rather than those in charge of local health services. The objective of this paper is to analyse how HIS influence the emergence of local accountability practices and their consequences for the provision of health care. A theoretical perspective from structuration theory is built and integrated with the technology domain of HIS. This perspective is used in the analysis of a case study of HIS in Kenya. This study raises implications for the use of structuration theory in understanding accountability and the role of IT materiality in processes of structuration. It contributes to a better understanding of how HIS can foster improved health care and human development. It also contributes to the understanding of IS not just as means for governing people's behaviour but also as means of socialization through which users can negotiate multiple accountability goals.

Keywords: health information systems, information technology, accountability, health care, Africa, structuration theory

## **Introduction**

Accountability and good governance are often at the centre of development programmes (Bangura & Larbi, 2006; Djelic & Sahlin, 2006) in order to fight corruption, mismanagement, and inefficient bureaucracies (Drori, 2006; Hood, 2000; Lynn, 2006). The argument of most development programmes is that the social and economic development of a country is more

likely to be achieved if policy-makers and civil servants are held accountable for their actions (Ciborra, 2005; Ciborra & Navarra, 2005).

In the health sector, assumptions about the benefits of accountability have driven the implementation of health information systems (HIS). The idea behind HIS is that health information can allow for better planning and monitoring of the health services, which may translate into better health outcomes. Yet, the literature on HIS in low- and middle-income countries (LMICs) has been quite critical about the counterproductive effect of the strengthening of HIS as a means to achieve accountability (Madon, Krishna, & Michael, 2010). Donor agencies and governments would mostly use HIS to monitor health programmes and how money invested in health care is spent. According to both academics and practitioners, accountability results in the fragmentation of HIS, causing little use of information to improve health care services at the point of delivery (Sahay, Saebo, Mekonnen, & Gizaw, 2010; Smith, Madon, Anifalaje, Lazarro-Malecela, & Michael, 2008).

Recent research has mainly considered accountability as a managerialist concept translated into LMICs from Western nations through international policy reforms and imported information systems. As a result, local actors struggle to fully understand and internalize accountability (Ciborra & Navarra, 2005). In the health sector specifically, the main motivation for accounting for results is to gain legitimacy for further funding or to avoid sanctions. The main problem with this attitude is that the gap between HIS outputs (e.g., number of patients admitted to hospitals) and ideal performance outputs (e.g., improved health service utilization) widens (Noir & Walsham, 2007). Knowing about the number of patients that use the health service is not necessarily followed by the right action to improve health service utilization. Narrowing the gap between HIS outputs and ideal outputs requires a greater understanding of the value of health information in accounting for results and improving decision making in the health service. A more productive use of health information depends on how local HIS users legitimize accountability in their day-to-day work.

Thus, the objective of this paper is *to provide a greater understanding of how HIS influence the enactment of accountability and with what implications for a better use of*

*information in health service delivery*. In particular, the paper will seek to answer the following questions: i. how does accountability acquire legitimacy and become enacted locally? ii. how do the capabilities of HIS mediate the enactment of accountability?

The author conducted an interpretive study about HIS in Kenya. Based on the insights gained from the findings, the paper delivers the following contributions. First, the paper integrates the notion of materiality in structuration theory. In this way, it considerably sharpens the theoretical perspective of structuration theory for a better understanding of how IT relates to the socio-organizational context. More specifically, the paper adopts structuration theory as a sensitizing lens to understand the recursive relationship between social structures and agency and its implications for the reproduction of accountability. Acknowledging the limitations of structuration theory in understanding material agency (Jones, 1999; Jones & Karsten, 2008; Silva, 2007), this paper builds on Sewell's (1992) work on structuration theory and adopts the notion of "interpretive flexibility" to account for the material features of HIS in processes of structuration. The framework is used in the analysis of findings.

Second, it increases the understanding of how HIS can foster development by taking a human development perspective that considers health care and access to information fundamental human rights (Andrade & Urquhart, 2009; Silva & Westrup, 2009; Zheng, 2009). Traditionally, a neoliberal logic has influenced the use of ICT for development and in the provision of health care (Madon, 2009; Navarra & Cornford, 2009; Schuppan, 2009). Under this logic HIS are used to monitor the economic return of health care interventions and promote an efficient use of resources. By taking a human development perspective, this paper shifts the attention from the funders to the recipients of health care and seeks to understand how health care managers can use HIS to address the needs of their communities.

Finally, this paper contributes to further our understanding of how information systems mediate the enactment of accountability. Most IS research focuses on accountability as a means for controlling behaviour (Constantinides, 2011; Doolin, 2003;

Vieira da Cunha, Carugati, & Leclercq-Vandelannoitte, 2015). This study takes a sociological perspective on accountability (Roberts, 1991) and unveils how IS mediate the socializing effects of accountability.

This paper is organized as follows. The next two sections review the literatures on IS and accountability and the role of HIS in enforcing accountability. Next, an examination of the theoretical framework is provided followed by an illustration of the research method, the case study description and analysis. The paper closes with a discussion of findings followed by implications and conclusions.

### **Information systems and accountability**

Accountability is “a social relationship in which an actor feels an obligation to explain and to justify his or her conduct to some significant other” (Bovens, 2005, p. 184). Information systems are often used as means of control and surveillance to hold people accountable for their actions, for example, through the monitoring of quantitative measures of processes and outcomes (Constantinides, 2011; Doolin, 1998). The use of information systems in monitoring performance has been criticized for providing false representations of work, mainly because of management’s pressure to comply with targets that are often unachievable. This often results in poor quality of information which can mislead decision makers (Vieira da Cunha et al., 2015). Similar problems have affected HIS in LMICs where health workers have been found to misreport data in order to escape reprimand for missing targets (Kimaro & Sahay, 2007; Noir & Walsham, 2007).

Thus, accuracy of information used in decision making is not only dependent on system quality, as is suggested in other studies (Li, Peters, Richardson, & Watson, 2012), but is also related to behavioural norms regulating the use of IS to account for results. Norms legitimizing accountability are not always resisted. Recent research has documented the role of IS in making actors’ actions more visible and, therefore, accountable to the work of their team or organization members (Constantinides, 2011; Doolin, 2003). Actors thus become self-disciplined subjects and more aware of the consequences of their actions and

less likely to repeat mistakes (Doolin, 1998). By interacting with an information system, users internalize norms of behaviour inscribed in its design. An example of such norms could be the “efficient use of clinical resources” by medical staff in a hospital. By mediating discourses and meanings that characterize everyday life in an organization, information systems contribute to the internalization of norms holding people accountable for their behaviour (Doolin, 1998).

Even though recent research has acknowledged the role of IS in mediating meanings and behaviours of accountability, it still privileges an individualizing form of accountability (Roberts, 1991) whereby IS reinforce norms of control by making our behaviours more visible to the “invisible power” of management. Thus, IS mediates objective representations of our performance through which we seek to stand out and isolate ourselves from our peers (Roberts, 1991). In contrast, a socializing form of accountability is enacted through dialogue and individuals learning from each other’s experience. Dialogue is more likely to occur and produce socializing effects when there are no power differences among individuals (Roberts, 2001). For example, in a study about primary care by Madon & Krishna (2017), actors understand the importance of accounting for expenditure and resources through social learning and knowledge sharing. The IS literature has overlooked such a socializing form of accountability, which can be particularly useful in understanding how IS can contribute to making decentralized work accountable not just through control (Bloom, Garicano, Sadun, & Van Reenen, 2014) but also through social interactions and learning.

### **Bureaucratic and democratic accountabilities in the context of HIS**

The literature distinguishes different forms of accountability. In relation to IS in the health sector specifically, it is possible to recognise *hierarchical or bureaucratic forms of accountability* (Lupson & Partington, 2011; Yang, 2012), through which funding and regulatory bodies expect IT systems to work as monitoring tools with a view to minimising error in clinical practice (Bloomfield & McLean, 2003; Davidson & Chismar, 2007; Doolin, 2004; Jensen, Kjærgaard, & Svejvig, 2009) and improving the distribution and allocation of

resources (Madon et al., 2010; Noir & Walsham, 2007). In return, by using IS to be more accountable, health professionals and managers gain legitimacy to qualify for further funding.

“Bureaucratic accountability for performance” (Lupson & Partington, 2011, p. 912), is a form of “upward” accountability (Baur & Schmitz, 2012) that controls for performance and limits the action of individuals. For example, there can be tensions between funders’ expectations of budgetary limitations to professional action and the “autonomous exercise of professional judgment” expected by clinical professional bodies (Freeman, McWilliam, MacKinnon, DeLuca, & Rappolt, 2009). Another major downside of bureaucratic accountability is that it “reduces accountability to mere financial accounting without fully involving those affected by their activities” (Baur & Schmitz, 2012, p. 14). In this way, the day-by-day added value of local practices becomes invisible behind macro-numerical representations (Keevers, Treleaven, Sykes, & Darcy, 2012). In the health context, the use of IS to account for results at the national level undermines efforts to be more accountable to beneficiaries, in particular, health care providers and patients.

The debate over bureaucratic accountability is particularly heated in the context of international aid in LMICs. On the one hand, powerful stakeholders such as donor agencies and national governments exercise a lot of pressure to ensure financial and performance accountability (Mekonnen & Sahay, 2008; Piotti, Chilundo, & Sahay, 2006; Smith et al., 2008). On the other hand, health care professionals are often affected by the limitations of bureaucratic accountability. They often contest the use of HIS to monitor their performance claiming that they serve more the needs of funding bodies, government bureaucrats, and health managers rather than the needs of health professionals and their patients (Madon et al., 2010). Thus, health workers in charge of collecting data often prioritise the care of patients over data reporting, which reduces the effectiveness of HIS in performance monitoring (Chilundo & Aanestad, 2004; Piotti et al., 2006).

Hence, available studies suggest that bureaucratic accountability has increased the legitimacy of HIS as monitoring tools rewarding national governments with funding. Yet, it

has decreased the legitimacy of HIS among its main users such as health workers, and, therefore, reduced the effectiveness of HIS in addressing the needs of local communities.

The controversial effects of bureaucratic accountability have raised the need to revisit the role of HIS in favour of “democratic” accountability (Madon et al., 2010).

“Democratic” accountability is a political and socializing form of accountability (Lupson & Partington, 2011; Mulgan, 2000; Pina, Torres, & Acerete, 2007; Roberts, 1996). It requires public service workers to interact with each other and engage with the public to cater for citizens’ needs and concerns (Brinkerhoff, 2004; Madon & Krishna, 2017).

According to previous research, devolution and a decentralised HIS are two of the main factors that can enable “democratic” or “downward” accountability in the health sector (Madon et al., 2010). With devolution, local health authorities are granted more autonomy in the use of local resources to meet the needs of their communities. A decentralised HIS can equip local authorities with the necessary tools to capture and analyse data locally. Yet, there does not seem to be any empirical study that shows how a decentralised HIS, matched with devolution, leads to a more democratic form of accountability which enables a productive use of information in health service management. The case study analysed in this paper demonstrates how centralized and decentralized practices of accountability may coexist, adding to the complexity of the impact of HIS on health service planning and management.

### **Structuration theory**

Scholars in the IS field have used Giddens’s structuration theory (Giddens, 1979, 1984) mainly to understand how users’ interactions with IT evolve, what the organizational implications of these interactions are, and how we can try to deal with their intended and unintended consequences (Barley, 1986; Jones & Karsten, 2008; Pozzebon & Pinsonneault, 2005). Researchers have also used structuration theory to understand processes of stability and change of social practices in relation to ICTs in cross-cultural global/local settings (Sarker & Sahay, 2003; Schultze & Orlikowski, 2004; Walsham, 2002).



One of the major tenets of structuration theory adopted in IS research is the notion of “duality of structure”, whereby structure is both the medium and outcome of human interaction (Giddens, 1979, 1984). Structures are the “rules and resources, recursively implicated in the reproduction of social systems” (Giddens, 1984, p. 377). Structures have only a “virtual existence” that becomes instantiated in action. They are the principles that pattern human practices and exist only as recursive enactments (Giddens, 1984). On the one hand, social structures condition agency. On the other hand, actors reflexively monitor their actions, and have the capability to “make a difference” or produce an effect (Giddens, 1984, p. 15) by mobilizing existing stocks of resources, norms, and knowledge (“modalities”, i.e., the linkages between social structures and agency) that transform, respectively, structures of domination, legitimation, and signification. In this sense, structures are both constraining and enabling. Reflexive monitoring implies the knowledgeability of actors who “know a great deal about the conditions and consequences of what they do in their day-to-day lives” (Giddens, 1984, p. 281). It also reflects the purposive character of human agency whereby actors always know the intentions of their actions.

This study builds on previous work on structuration theory that views technology as embodying norms and rules that human actors recursively enact through their actions (Orlikowski, 1992; Walsham, 2002). In so doing, actors may reinforce or change social structures while they reproduce or reinvent the technology’s structural properties. In other words, “IS are drawn on to provide meaning, to exercise power, and to legitimize actions” (Walsham, 2002, p. 362). Yet, the view of social structures enduring within the materiality of technology has been criticized for being incompatible with the virtual character of Giddens’s structures (Jones & Karsten, 2008). Because this study seeks to understand how HIS capabilities mediate the enactment of accountability, it is important to account for the role of IT materiality in the explanation of this social phenomenon.

One perspective that seeks to understand how IT materiality is constitutive of social practices is sociomateriality. There are two ontological positions of sociomateriality (Cecez-Kecmanovic, Galliers, Henfridsson, Newell, & Vidgen, 2014). The first one is based on

Barad's "agential realism" and considers the material and the social as intricately related. What is social is also material, and vice versa and the two become constitutively entangled to generate "sociomaterial practices" (Orlikowski, 2007). The second one builds on critical realism to consider the material and the social as two discrete entities that constitute each other through their interaction (Leonardi, 2013; Mutch, 2013). Yet, neither of these perspectives of sociomateriality can be used to account for the recursive instantiation of social structures in action and reflexivity as structuration theory does. Actors do not only reflexively monitor their actions and the actions of others, but they also expect their actions to be monitored (Giddens, 1984). Through reflexive monitoring actors constantly seek justification for their actions in accordance with "what is normal and expected" (Giddens, 1984, p. 30). Structures of domination, legitimation and signification hold actors accountable by ensuring that their behaviour is socially acceptable. For these reasons, structuration theory is a good foundation for this study, and therefore a way to integrate materiality within structuration theory is needed.

In order to overcome the undertheorization of materiality within structuration theory, Sewell (1992) proposes that "allocative resources" being non-human and therefore material – and which Giddens acknowledges to be implicated in the reproduction of social structures – are "actual" rather than "virtual". Based on this new definition of resources, structures retain their virtual quality in the form of rules and norms, while resources are the outcomes and means of structures. It is only by accessing resources that agents can enact rules and norms. For example, from the material resources of a factory, such as the design of its assembly line, one can infer the rules that govern work in a capitalist society (Sewell, 2005).

Sewell's reconceptualization of "allocative resources" is a first step towards acknowledging that the structural properties of IT, which are material and, therefore, non-virtual, can be implicated in processes of structuration. Similar to the factory in Sewell's example, a technology has material features that constitute the meanings users associate with it and, therefore, influence how users use the technology (Doherty, Coombs, & Loan-Clarke, 2006). Thus, the materiality of technology has an impact on society by contributing to

shaping users' intentions to use it in a certain way. In particular, the degree to which a technology shapes the social structures, such as norms, rules, and meanings emerging from its enactments, is defined by its "interpretive flexibility" (Bijker, 1987; Orlikowski, 1992, 2000). Interpretive flexibility is the extent to which the material features of an IT "might limit its ability to be interpreted flexibly" (Doherty et al., 2006, p. 569), which, as a result, limits the ways IT can be used and have an impact on society. Thus, interpretive flexibility determines the extent to which users can draw on the norms and values of their surrounding institutional context to interpret a technology (Orlikowski, 1992). On the one hand, the material features of an IT constitute the meanings that are recursively implicated in its use and the consequent reproduction of social structures. On the other hand, the social domain, comprising norms, rules and other resources, influence how users interpret and use an IT within the boundaries of its material features.

In summary, building on Sewell's conceptualization of the materiality of allocative resources within structuration theory, this study adopts the notion of "interpretive flexibility" to better account for the materiality of technology in processes of structuration. Under this perspective, the material features of HIS define the rules and norms implicated in the reproduction of social practices that perform accountability. While actors reflexively monitor their situation and actions, the interpretive flexibility of the HIS marks the boundaries within which the technology domain (i.e., the material features of a technology) and the social domain (i.e., power relations, norms and meaning systems of a social context) mutually interact and shape users' interpretations of the HIS. Users' interpretations will then influence how the HIS is implicated in the reproduction of structures (domination, legitimation, signification) and the consequent enactment of accountability either through means of control (bureaucratic accountability) or through socialization and the sharing of knowledge, norms and values (democratic accountability). Figure 1 illustrates the structural perspective adopted in the analysis of the case study of HIS in Kenya.

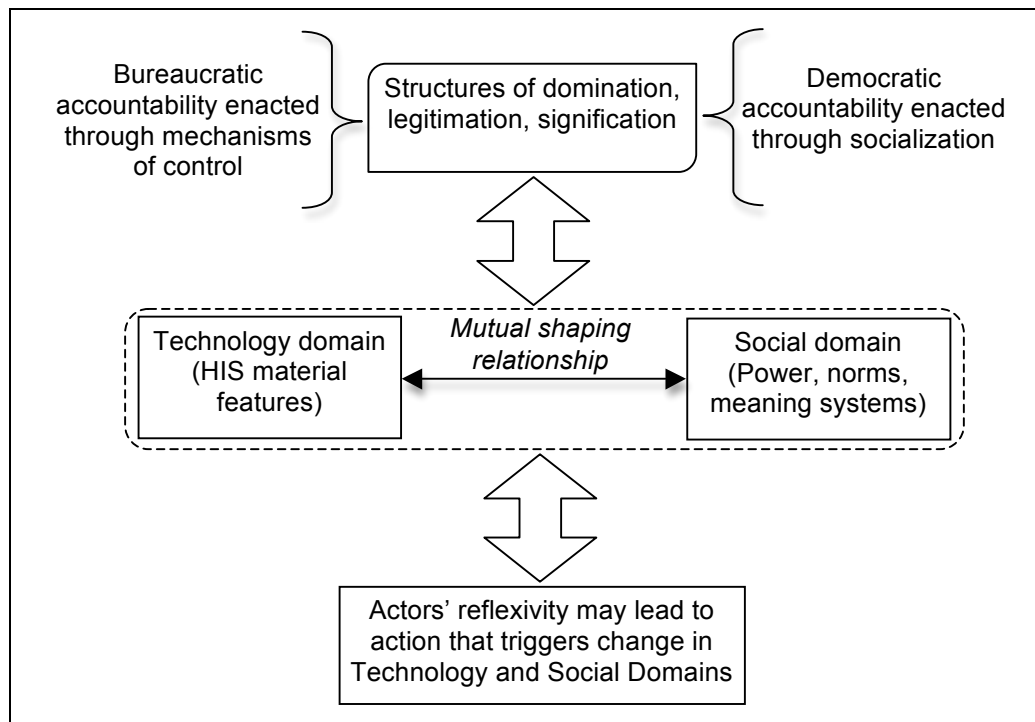


Figure 1. A structuration theory model of IS-mediated accountability

## Research method

### Data collection

The research is based on a case study of the Ministry of Health's information systems in Kenya. Data were collected from interviews and documents between 2007 and 2015. Between 2007 and 2008, a sample of thirty-eight semi-structured interviews was collected, together with four unstructured interviews held with four senior officials of the Government of Kenya. Informants from the Ministry of Health and the Government of Kenya were selected based on the relevance of their role in relation to health sector reforms and the restructuring of health information systems, and, whenever possible, based on the earliest date of deployment, given the importance of gathering historical accounts.

In the Ministry of Health, the sample of informants included different organizational roles, such as HIS officers, medical officers occupying a managerial role, and senior government officers. This was part of a "comprehensive sampling" strategy (Miles & Huberman, 1994, p. 38) in order to have a more systemic view of the evolution of the

information systems and gather diversified perceptions of institutional and technological changes and their implications for working practices and management structures.

In 2011, six informants from international donor agencies were also interviewed over the phone in order to gain the perspective of the main international actors involved in the implementation of health sector reforms and HIS in Kenya. In 2015, eight phone interviews were conducted with the users of a new decentralised HIS, DHIS2. The total number of interviews collected is fifty-six as shown in Table 1.

<b>Participants</b>	<b>2007</b>	<b>2008</b>	<b>2011</b>	<b>2015</b>	<b>Totals</b>
Two multilateral donor agencies			3		3
Three bilateral donor agencies			3		3
Senior Government Officers	1	3			4
HIS Officers		19		7	26
IT officers		3			3
Medical officers		16		1	17
<b>Total</b>	<b>1</b>	<b>41</b>	<b>6</b>	<b>8</b>	<b>56</b>

Table 1. Overview of interviews

Primary data from interviews were integrated with a sample of approximately 6,000 pages of documents taken from the archives of the Ministry of Health. These included government policy documents, minutes of meetings, letters and HIS reports covering a period from 1977 to 2008. Relevant international agencies' policy and project documents available from the Internet were also collected. With respect to interviews, documents were a valuable historical source of information for tracing past events and practices that the memory of informants could not recall.

### ***Data analysis***

Interviews and relevant documentary extracts were transcribed and coded. Based on the key ideas of an inductive methodology (Birks, Fernandez, Levina, & Nasirin, 2013; Glaser & Strauss, 1967; Sarker, Lau, & Sahay, 2000; Urquhart, Lehmann, & Myers, 2010), the structuration theory framework represented in Figure 1 was used as a guide and coding was conducted by remaining open to emergent phenomena (Zietsma & Lawrence, 2010).

Through “open coding”, codes were constructed inductively by identifying concepts inferred from the data (Glaser & Strauss, 1967; Orlikowski, 1993; Strauss & Corbin, 1990).

Finally, “axial coding” was used in order to organize codes under a more comprehensive scheme of recurring themes or common categories (Strauss & Corbin, 1990). Second-order codes included themes such as power (representing availability and mobilisation of resources), norms, meaning systems, technology features, and structures of domination, legitimation and signification. Relevant data were then analysed based on an interpretive approach. Interpretive research acquires knowledge of reality by analysing meanings that people assign to events, speeches, documents and artefacts (Klein & Myers, 1999). It is useful in understanding both the context in which information systems are situated and the processes through which information systems influence and are influenced by context (Walsham, 1993, 2006). Under this perspective, it is thus possible to unravel the complex interaction between multiple actors, context, and technology. The interpretation of data coded was used to piece together a narrative of events telling the story of how accountability gained legitimacy. A summary of the coding scheme is available in the Appendix.

## **Case study**

Until 2010, the health information system in Kenya was mainly paper-based. Data were collected at health facilities that would then send data reports to the district level. Districts would aggregate these data on summary forms and send them to the national level. International donor organizations were funding *ad-hoc* information systems within specialized programmes such as Immunization and HIV/AIDS to control how their money was spent. Thus, they increased the workload of health staff in charge of collecting data (HIS, 1980).

The end of President Arap Moi’s undemocratic and corrupted regime after the General Elections of 2002 boosted donors’ confidence and spending in Kenya. Higher donor contributions to the country’s health sector increased donors’ demand for health information

to account for results. Regardless of a new policy to integrate health information systems under the Division of HMIS (Health Management Information Systems) in the Ministry of Health (Ministry of Health, 1997, p. 43), donor organizations intensified their support to health programmes' information systems. As a result, districts were just reporting data to the national level without seeing the value of the information collected. In order to improve the use of health information at district level, in 2010, the Ministry of Health started the implementation of a new decentralized information system, DHIS2 (District Health Information System). DHIS2 was rolled out to all 47 county governments created after the devolution reform of 2010.

Against the backdrop of these events, the case study that follows analyses the processes through which HIS users enacted accountability in the National Programme of Immunization. The focus then shifts to the enactment of accountability following the implementation of DHIS2 in 2010. Because the system is used across all levels of the Ministry of Health, this part of the case study narrates the experience of HIS users both at county and national level. Users at the national level include HIS officers at the Division of HMIS and other national health programmes.

### ***The information system of the Programme of Immunization***

Towards the end of the 1990s the WHO recommended that all countries set up efficient information systems for disease surveillance and routine immunization monitoring (WHO/Africa, 1992). Thus, information became a key asset for the planning of activities of the Programme of Immunization in Kenya. In this regard, one of their plans of action stressed the importance of data "in guiding decisions" (KEPI, 1996a, p. 1).

Most officers working in the Programme in the 1990s confirmed that after the start of donor-funded polio campaigns, they experienced an increase in the demand for information to plan for immunization and disease surveillance activities. The vaccines manager said that they wanted to improve the quality of their service through better monitoring of their performance and supplies:

*“We wanted to improve quality of service giving kids potent vaccines [...]. We also used to have a lot of wastages... so we wanted to be more accountable with the supplies that we were using, especially the vaccines and also... the syringes and needles”.*

Yet, in one meeting it was noted that the reporting rates from the districts were very low and that the Programme’s management was not using information (KEPI, 1996b). An HIS officer for the Programme stressed how he and other HIS officers tried to improve the performance of the information system in order to convince their managers of the value of information for the monitoring and planning of the Programme’s activities:

*“Over time we have been able to improve on the timeliness and [completeness] of data from the districts. This helped the managers and the users of these data to really accept what we have been doing”.*

In particular, the Programme intensified supervision at the districts in order to exhort them to send data reports to the national level as suggested in this quote by a HIS officer:

*“There was a quarterly meeting where every district could be put on the screen, these are your reports this is how you are performing let us know what’s happening”.*

The Programme received little funding from the Ministry of Health and, for the most part, was dependent on donor funding. Therefore, when donor agencies cut their contributions to immunization to focus on other health priorities (e.g., HIV/AIDS) (KEPI, 2001), the Programme was struggling to supply districts with resources essential for the functioning of the information system, such as data reporting forms (KEPI, 1998).

In 2001, donor funding for immunization was revived thanks to the Global Alliance for Vaccines and Immunization (GAVI). GAVI released funding to Kenya through a “performance-based grant programme” (GAVI, 2007), which contributed to the strengthening of the monitoring and evaluation system through a Data Quality Audit (DQA) (GAVI, 2004). A HIS officer described the new funding scheme as:

*“A reward system whereby districts get slightly more funds if they report more children so that they can reach many others. It makes sure that every child that is immunized is reported; if they [don’t], they would have problems with funds”.*

Various HIS officers said that donor agencies, such as WHO, UNICEF, and GAVI, were the major consumers of immunization data. In an interview, the Programme manager confirmed that GAVI joined other donor partners as the main drivers of the Programme’s



activities and its information system. She added that the start of GAVI's DQA put more pressure on the Programme to strengthen their information system:

*"GAVI put on an auditing reward system in 2004 as there was a shame in the country that data management was not good enough and this incentive was a driver for us to improve our data management".*

In order to improve data management and the timeliness of data from the field, the Programme Manager led the introduction of standard operating procedures (SOPs), which shifted data entry duties from 78 districts to 8 provinces in the country. The reduction of workload from 78 to 8 reports, she said, cut delays in reporting. One year later, in 2004, the provinces started using a new system, EPI-Info, to enter data received from the districts into a computer and send them to the Programme's data management unit.

Following these changes, one programme officer suggested that, by 2008, the usage of information for the planning and management of the Programme's activities had become a consolidated practice. Another officer recognized the importance of the programme manager who involved HIS officers in the planning of the Programme's activities:

*"The head brings us together and during the planning she allows each person professionally to express your skills within your area of adjudication".*

One medical officer and qualified epidemiologist, member of the programme management team, stressed the importance of data to make decisions:

*"We have to decide [...] when there is a threat of a disease [...] or, as a vaccination programme, we also want to know how many children we are able to reach. [...] Data management informs our decision in many ways".*

After the Division of HMIS took charge of health sector monitoring (HMIS, 2005), all health programmes were required to integrate their information systems (HIS, 2000). Yet, like other health programmes, the Programme of Immunization was reluctant to integrate its data management system with the Division of HMIS because it relied on data from the districts to account for donor funding. Thus, there were conflicts over who should manage the data as reported in an official document from the Ministry of Health:

*"The District Public Health Nurse preferred to do his own data management of [immunization] data and therefore pressured the supervisory team to set up the HMIS software separately on his computer. He cited the lack of confidence in the [district HIS*

*officer] as the main reason. Thus, data is now being managed separately” (Ministry of Health, 2006).*

### ***The HIS after the implementation of DHIS2 and devolution***

Because the Division of HMIS and national health programmes were the main users of health data, health workers and managers on the field did not fully appreciate the value of health information for their work. Thus, in 2010, with the technical assistance of the University of Oslo, the Ministry and its donor partners supported the implementation of a District Health Information System (DHIS2) with the expectation that it would increase the use of information in health services management at the local level (Karuri, Waiganjo, Orwa, & Many, 2014). DHIS2 is a cloud data management application for the collection and analysis of health data. Given the limited internet connectivity, the system is equipped with a local datamart for offline data entry. Data can be stored on a central server when online (Many, Braa, Øverland, Titlestad, & Mumo, 2013).

After devolution in 2010, the Government created 47 counties that replaced the districts and provinces. Each county government was responsible for supporting DHIS2 in their own area and had full autonomy in using health data to manage their own services. Data collected at health facilities were entered into DHIS2 at sub-county and county levels and made accessible to all HIS users in the country.

Some participants argued that certain counties were still behind in the use of data. Others suggested that those counties with the means to support DHIS2 and make it function were using data more actively. Some HIS officers seemed to value the role of health information in health service management more than others, as suggested in this interview with a county HIS officer:

*“I have a passion for my profession [compared to others whose] mindset is about earning a salary [...]. Some people do not care about monitoring information, but what I care is the use of information, the impact it has”.*

Some HIS officers recalled how hard it was to be involved in health management teams before devolution. By contrast, after devolution the impact of DHIS2 and the use of health information were more evident in those counties where HIS officers and health

management teams were working hand-in-hand, as suggested in this quote by a national HIS officer:

*“There are counties where our [HIS] officers are doing very well [...] in guiding the whole staff [on] how to use indicators and [ensuring] that [anyone] in the county [knows that] indicators are part of everyday life”.*

A medical officer in charge of health informatics at the national level said that, DHIS2 got medical officers and other users more interested in health data not only by giving unlimited data access, but also by improving data consistency:

*“DHIS helped to use the data at the point of collection. [...] It worked well, it was easy, people started to be interested in the data... [Consistency has improved]. Even if the data is poor quality, it is all the same... Data improve confidence in the things we say”.*

The growing interest in DHIS2 was also demonstrated by available statistical evidence which indicated that, as at September 2013, data entries into the system had increased from 880,600 to 1,254,993 in the previous 30 days (Karuri et al., 2014). Most county HIS officers confirmed that their managers were using data in health service management.

HIS officers at the Division of HMIS and other national health programmes were able to customize their reporting forms into DHIS2. County and sub-county HIS officers would then use DHIS2 to key in data directly into the reporting forms. National HIS officers could access these data directly on the national server and use the pivot tables of DHIS2 to analyse and use the data in order to comply with their obligation to report to the Ministry of Health and international donor agencies. Thus, they had to make sure that data entered into DHIS2 met certain quality standards:

*“We have to report both at the national and international level [...]. We need to [...] [provide] [data quality] guidelines [to the counties]”.*

Counties were under pressure to provide the national level with the information needed to account for the distribution of resources in the health service:

*“Counties increased information use because, at the national level, there is demand for evidence. The national level wants to see in the DHIS whether malaria has been reported and from which facility”.*

A national HIS officer working for the Division of HMIS stated that some county administrators did not fully appreciate the value of indicators in health sector planning:

*“Politicians do not understand [the] meaning of indicators. [...] It is an issue of accountability: how do you account for that money spent? [...] They get a block of money [...] but they do not know whether it is for preventive or curative services. [...] For example, now we have a problem of cholera; [...] because [...] politicians [...] did not take time to plan, they were given inadequate budget to [prevent the epidemics]”.*

Other counties questioned the value of the information that they were asked to collect, as reported by a medical officer at the Ministry:

*“Some of the counties would question why they are collecting so many indicators [...]. Some of the donors work just in some areas [...] Counties who do not have malaria at all, [they have to report] national indicators [of malaria]”.*

Table 2 summarizes findings of the case study. A structurational analysis of these findings is provided in the next section.

	Programme of Immunization	DHIS2
Key events	WHO recommends set up of efficient IS (1990s). GAVI performance-based grant programme (2001).	Adoption of DHIS2 and decentralization of HIS (2010). Devolution and the creation of 47 counties (2010).
Main actors	Programme/HIS officers Programme manager	County HIS officers County administrators National HIS officers
Actions	Before GAVI, HIS officers seek to improve data reporting to convince management of the value of information. After GAVI the programme manager feels the pressure to strengthen the IS.	Counties with more resources use data to manage their services. Counties question the value of the national indicators they have to report.
Outcomes	Epi-Info software and SOPs are implemented. Consolidated use of information for planning and managing Programme's activities.	Some county administrators do not use information for planning.

Table 2. Summary of findings

### Structurational analysis

This section provides a structurational analysis of the case study illustrated above. The focus is on accountability practices and how they emerged and evolved from the interplay between the technology and social domain of the HIS. The theoretical framework used in the analysis comprises: agency (users' actions), social domain (power, norms, and meanings), technology domain (the material features of the HIS), and the structures (domination,

legitimation, and signification) that underpin the enactment of accountability.

### ***Bureaucratic accountability: The case of the Programme of Immunization***

After the WHO recommended the strengthening of routine immunization information systems and diseases surveillance, the *assumption* that data were important in guiding decisions became one of the key drivers of the activities of the Programme of Immunization. Increased demand for information to plan for immunization campaigns and disease surveillance triggered the *reflexivity* of programme officers, who, as the vaccines manager explained, realized the need to strengthen their monitoring systems in order to account for medical supplies. The fact that some programme officers recognized the need to be more accountable reflects that accountability had been internalized in their practices.

In particular, HIS officers vowed to improve the performance of their information system to demonstrate how data could be used to monitor their programme's activities and convince their managers of the value of information. This is an example of *structures of signification* that support a socializing form of accountability (Roberts, 1991) where the use of HIS to monitor performance mediates the constitution of social relations between HIS officers and their managers. Such social relations can, potentially, support the local enactment of accountability. In addition, HIS officers were keen to improve data reporting on their programme's outcomes and activities to make their managers accept "what they had been doing". This finding exemplifies how the interests of a social group can mediate the social construction of accountability objectives (Anifalaje, 2012; Topp, Chipukuma, & Hanefeld, 2015).

Most of all, poor funding from the Ministry of Health and management's lack of legitimacy of health information underscore the weak response from local institutions to implement the goals of international organizations, such as the WHO that drove the set up of information systems for immunization. The result was the lack of institutional support to internationally-driven HIS at the local level, which highlights the tension between formal governance, i.e., what is written in policy documents, and informal governance, i.e., how

policy goals are translated (or are not translated) into action (Brinkerhoff & Bossert, 2014). In this case, the Ministry did not support immunization, which amplified the individualizing effects of bureaucratic accountability.

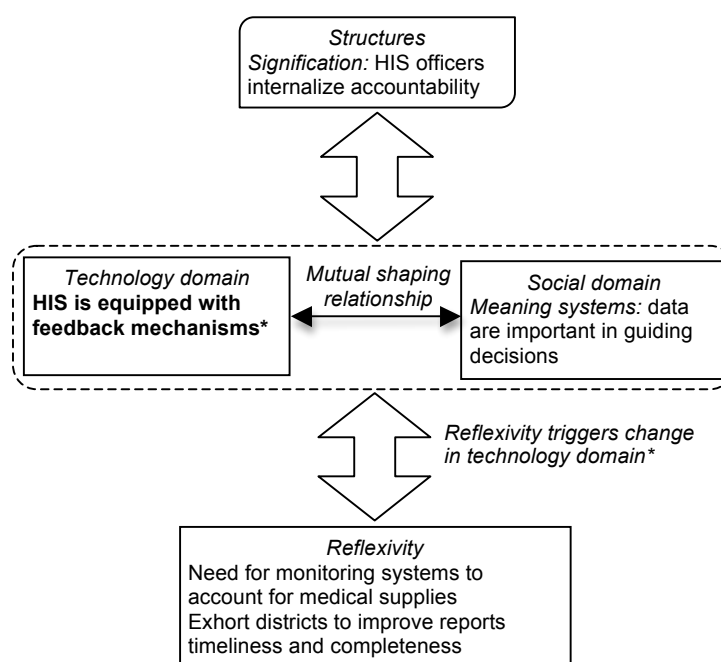
More specifically, lack of support enhanced the *reflexivity* of HIS officers who engaged in a series of activities meant to exhort districts to improve the timeliness and completeness of data reports. One of these activities was to provide feedback to districts about their reporting rates in order to strengthen manual reporting systems. The power differential between HIS officers and districts was an obstacle to the construction and sharing of common accountability objectives through socialization (Brinkerhoff & Bossert, 2014; Lodenstein, Dieleman, Gerretsen, & Broerse, 2017). Indeed, HIS officers engaged with the districts merely to impose the enactment of bureaucratic accountability. The result is that these actors used the HIS to enact just one mechanism of accountability, “answerability” (Topp et al., 2015) but neglected enforcement mechanisms (Brinkerhoff, 2004; Topp et al., 2015). Whereas answerability involves the provision of information about one’s performance, enforcement mechanisms sanction health authorities and providers for not meeting performance expectations.

An example of an enforcement mechanism is the performance-based grant that GAVI started in 2001. This new scheme of funding represented a source of *power* that legitimized donor support for the Programme’s information system. It also set in place new *structures of domination and legitimation* by tying funding to performance. Under this new funding regime, showing results was a *norm* that districts had to follow in order to get funding. In this example, management does not exercise its “invisible” power (Roberts, 1991) only through resource allocations but also through the mediation of rules and norms. In this way, structures of domination are interlinked with structures of legitimation, which are instantiated through the normative sanctioning of social practices (Giddens, 1984).

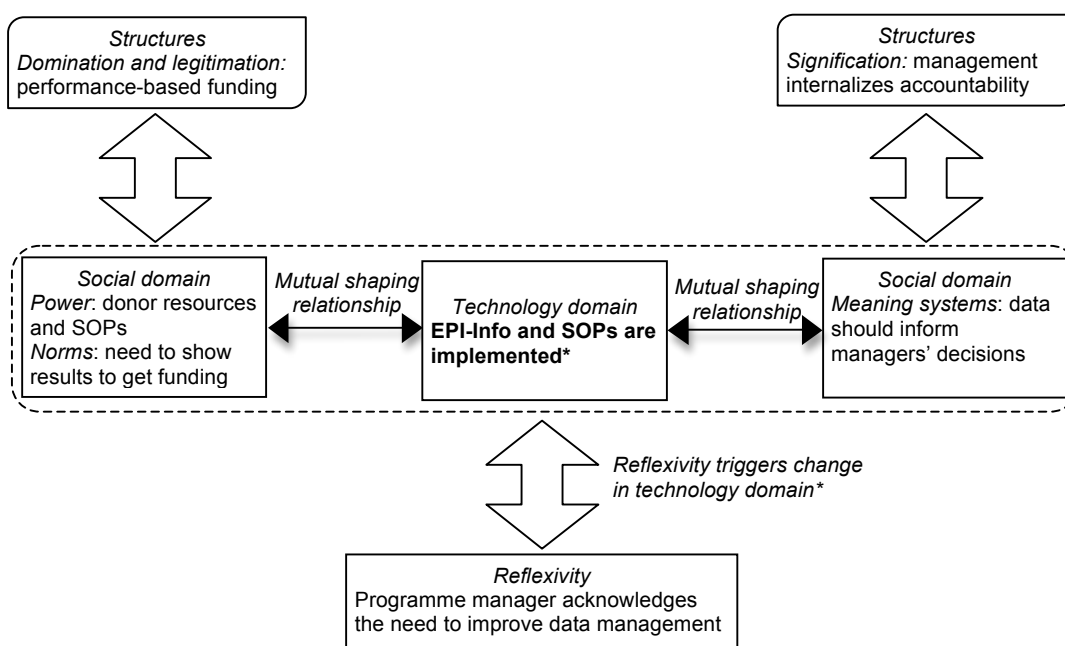
Acknowledging that the immunization information system was underperforming, the pressure to qualify for funding prompted the *reflexivity* of the Programme’s manager who set in place a series of actions meant to improve data management. As a result, the Epi-Info

software and Standard Operating Procedures (SOPs) were implemented at the provinces in order to improve the timeliness and, possibly, the accuracy of data reports. Arguably, SOPs were a means the programme manager could use to control data reporting from the field. The programme manager's engagement in the strengthening of the immunization information system shows that management had started to value information in decision making and had finally internalized accountability in its practices. The reinforcement of *structures of signification* in support of accountability is also demonstrated by socializing activities such as management's involvement of HIS officers in the discussion of accountability objectives and the *belief* that data should inform management's decisions as stated by a member of the management team. Here, socialization is meant to strengthen a centralized reporting of data to monitor performance, which is part of bureaucratic accountability (Brinkerhoff, 2004; Topp et al., 2015). By contrast, the shift of donor funding to other health priorities and the Programme's reluctance to collaborate with the Division of HMIS on the integration of HIS demonstrate how competition over scarce resources can inhibit socializing forms of accountability (Lodenstein et al., 2017). The result is that the achievement of accountability goals such as monitoring and improving health sector performance cannot be achieved. Tensions over the control of information were due to conflicting priorities of donor agencies who contradicted internationally driven reforms by sponsoring the information systems of multiple health programmes, and by so doing, amplified the individualizing effects of bureaucratic accountability (Roberts, 1991). Figure 2 summarizes the processes of structuration analysed above.

**Figure 2a. HIS officers internalize bureaucratic accountability**



**Figure 2b. Programme managers internalize bureaucratic accountability**



**Figure 2. The enactment of bureaucratic accountability at the Programme of Immunization**

### ***HIS decentralisation and democratic accountability: the case of DHIS2***

The poor legitimacy of health information at the lower levels of the health system was one of the main reasons driving the implementation of the new decentralized information system,



DHIS2. The Ministry of Health and donor agencies believed that by decentralizing the HIS, the use of health information for the management and provision of local health services would increase. Thus, after devolution and the creation of counties, DHIS2 changed the way health information was collected and managed. New *structures of domination* emerged, which gave county governments control over their own health data to manage health services locally. The case study shows how differences in *power* represented by an unequal distribution of resources enabled some counties to benefit from DHIS2 more than others. County HIS officers drew upon new *norms* that legitimized indicators as “being part of everyday life” in order to drive the use of health information for decision-making at county level. Now that county governments relied on DHIS2 to manage their own health services, normative behaviours that legitimized the use of indicators reproduced new *structures of legitimation* through which county HIS officers became fully involved in the work of health management teams (HMTs). Devolution and the decentralization of the HIS reduced the power distance and facilitated the dialogue between county HIS officers and health management teams, who were working “hand-in hand” and, therefore, enacted accountability through acts of socialization.

Other issues emerged in relation to the *meaning systems* underpinning the adoption of DHIS2. First, as one county HIS officer suggested, there were different mindsets about the use of health information and not everyone valued the impact of information on health service management in the same way. Second, a medical officer made the assumption that unlimited data access and improved data consistency that resulted from the use of DHIS2 triggered the *reflexivity* of medical officers and other users who became more interested in and could better understand health data. Therefore, DHIS2 mediated a socializing form of accountability whereby various groups of users, not just HIS officers, learned how data could be used to provide evidence about health interventions.

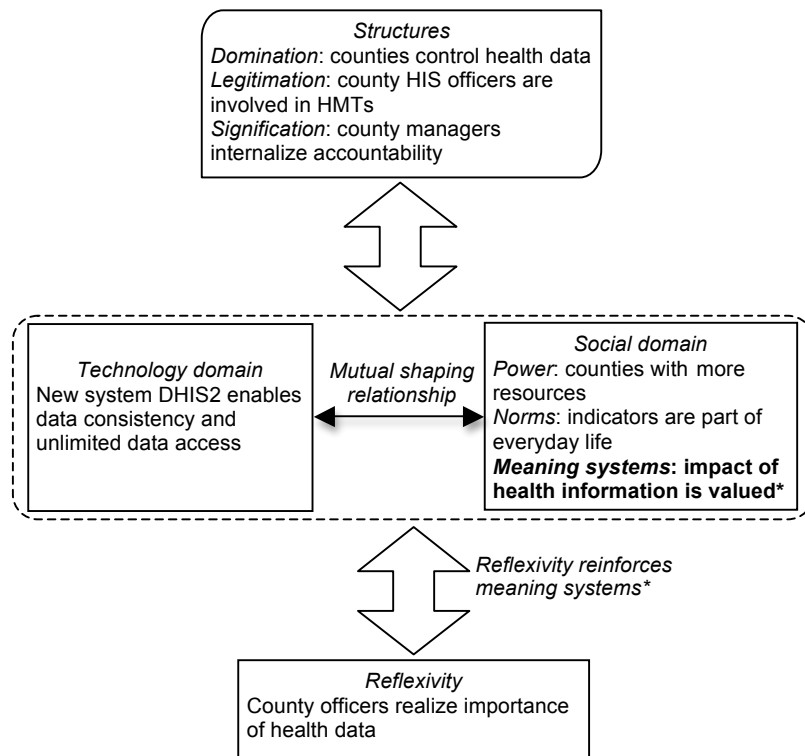
These findings point to a mutual shaping relationship between the social and technology domain. On the one hand, power in the form of availability of resources, together with norms and meaning systems that value the use of health information, influenced the

extent to which county users effectively engaged with DHIS2 in health service management. On the other hand, new norms and meanings that drove the use of DHIS2 can be related to the opportunities that the material features of the new system offered. In particular, norms and meanings emerging from users' interactions with DHIS2 contributed to the enactment of accountability through acts of socialization. The result is the emergence of a new *structure of signification* representing the internalization of accountability into county managers' practices as reported by some HIS officers. County managers used information to plan and manage local health services, which resulted in "democratic accountability". In contrast to "bureaucratic accountability", "democratic accountability" can increase local decision makers' interests in health information and their ability to value and use data to improve the delivery of health services to their citizens (Madon et al., 2010). With bureaucratic accountability, actors use information to satisfy the needs of their superiors; with democratic accountability, local health authorities and providers are held accountable to the needs of service users and, in particular, the poor (Brinkerhoff, 2004). Thus, democratic accountability can contribute to development since it helps service providers to understand and act upon the challenges that affect the health system in order to provide better healthcare to service users. In particular, the case study demonstrates that democratic accountability could be achieved through the acts of socialization that DHIS2 facilitated and through which actors could collaborate and better understand the needs of the health system.

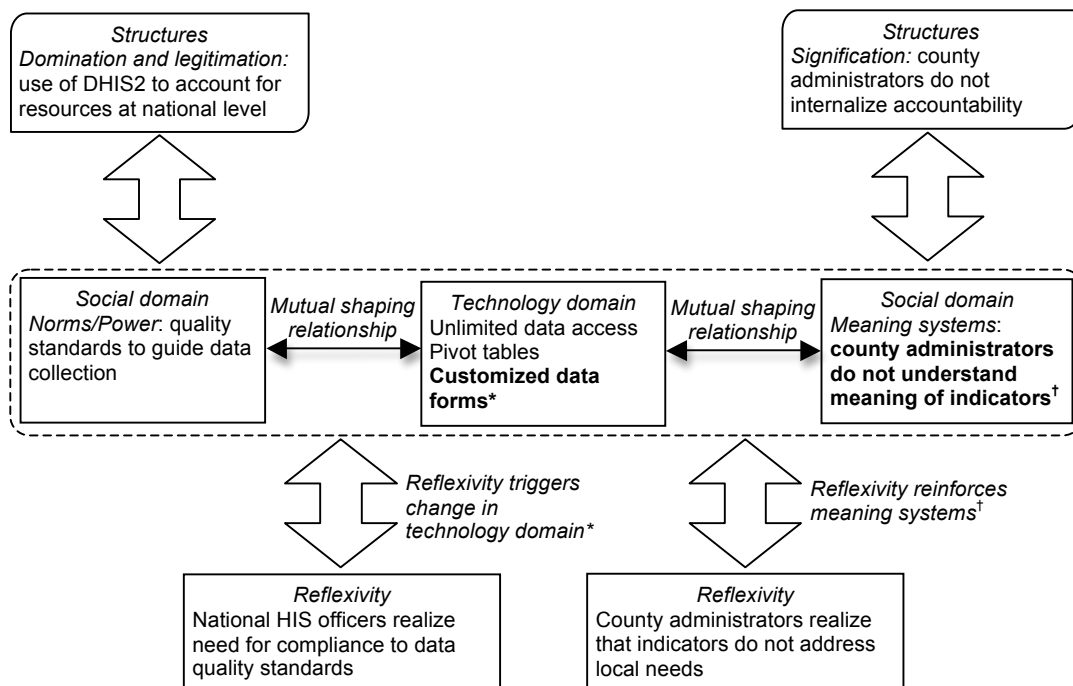
The case study also shows that counties were not only using information locally but had to comply with *structures of domination and legitimation* that governed the use of DHIS2 to account for resources at the national level. Thanks to the new system, national HIS officers could customize data reports in DHIS2, access data collected in the counties directly on the national server, and use pivot tables to improve data analysis. The importance of these data in complying with national and international reporting obligations prompted the *reflexivity* of the national HIS officers that provided counties with quality standards (or *norms*), gaining thus the *power* to dictate how they should collect and report data. One national HIS officer pointed to the lack of confidence in the capacity of some county

administrators to understand the *meaning* of indicators in health sector planning. Lack of confidence in the ability of political actors to understand health matters can constitute a barrier to dialogue and socializing forms of accountability (Lodenstein et al., 2017), which explains why there were no *structures of signification* that could adequately support the enactment of accountability in some of these counties. More specifically, the fact that some county administrators were not using information for budgeting demonstrates that accountability was not internalized in their practices. It is argued that the lack of *structures of signification* in support of accountability was, in part, the result of the *reflexivity* of county administrators concerning the utility of indicators in addressing the needs of donor agencies rather than local health service users. Most of all, because of its flexible design, DHIS2 could be customized to satisfy the information needs of the Division of HMIS and other national health programmes. As a result, the decentralization of the HIS did not reduce the power distance between the national level and the lower levels of the health systems. Counties perceived indicators as irrelevant because they were not involved in their design, which is another barrier to socialization (Lodenstein et al., 2017) and the enactment of democratic accountability. Figure 3 provides a summary of the analysis of the main structuration processes after the implementation of DHIS2.

**Figure 3a. County officers internalize democratic accountability**



**Figure 3b. Tension between national HIS officers and county administrators over bureaucratic accountability**



**Figure 3. The enactment of democratic and bureaucratic accountability with DHIS2**

## Discussion

Accountability is one of the major drivers of the deployment and use of HIS. The case study

analysed in this paper identified two types of accountability: bureaucratic and democratic. The discussion that follows provides a greater understanding of how HIS influence the enactment of accountability. In particular, it seeks to answer the research questions of this paper, first, by unveiling the processes through which accountability acquires legitimacy and is enacted locally, second, by demonstrating how the HIS capabilities mediate the enactment of accountability. Next, the major implications of this study are discussed.

### ***The enactment of bureaucratic accountability at the Programme of Immunization***

This section discusses the processes through which actors internalized accountability and the role of the HIS in mediating bureaucratic accountability at the Programme of Immunization. First, one process through which actors legitimized accountability was the alignment of structures of domination (power and resources), legitimation (norms), and signification (meaning systems). For example, some officers at the Programme of Immunization interpreted accountability as a means to account for results and resources in order to better plan activities. The meanings that these officers associated with accountability represent structures of signification through which they integrated accountability in their practices. Yet, it is not until donor intervention intensified that management also internalized accountability but with the intermediation of other structures, such as resources and norms that reproduced structures of domination and legitimation. Here, accountability acquired different meanings that legitimized new behavioural norms, such as “demonstrate results to access funding”.

Second, actors’ interests played an important role in the way they interpreted and internalized accountability, which shows the social nature of accountability (Anifalaje, 2012; Topp et al., 2015). For example, HIS officers at the Programme of Immunization developed meaning systems that legitimized accountability during a time when the Programme was underfunded in order to demonstrate the importance of their role. By contrast, structures of domination and legitimation, such as tying funding to performance, spurred management’s interest in the use of health information to account for results.

Therefore, interests of different groups of actors and social structures should be aligned to mediate the enactment of accountability. In particular, the case study shows how actors' socialization can be both a means and outcome of the alignment between social structures to achieve common accountability goals. For example, HIS officers at the Programme of Immunization engaged in acts of socialization to convince management of the value of data to account for the Programme's performance, whereas management started to involve HIS officers in the discussion of accountability objectives only after having legitimized accountability.

By contrast, when the interests and social structures that mediate accountability are not aligned, the individualizing effects of bureaucratic accountability are amplified and it is therefore difficult to achieve common accountability goals. In particular, the case study found that tensions between formal accountability goals of international policies and informal accountability goals of national governments and donor agencies can result in an uneven support to the HIS and limit dialogue among these stakeholders. For example, whereas the Programme of Immunization did not receive much support from the Ministry of Health, donor agencies were a major source of funding for its HIS. Yet, conflicting priorities among donor agencies, such as accounting for the performance of individual health programmes, contradicted the accountability objectives of international (and national) policies. This worsened competition over scarce resources and limited "socialization" and the achievement of common accountability goals among donor agencies and the Ministry of Health. While local actors cope with little institutional support and few resources, they may resort to actions that can limit socialization among stakeholders, particularly, across the national and lower levels of the health system. For example, HIS officers at the Programme of Immunization leveraged their power mainly to exhort districts to report information to the national level without putting in place enforcement mechanisms to sanction actors who did not meet immunization targets or showing them how data could be used to achieve those targets. An example of enforcement mechanisms is GAVI's performance-based grant that rewarded

performance by tying funding to results and mediated the realization of legitimation structures through which management internalized bureaucratic accountability.

Finally, the case of the Programme of Immunization offers a few examples of how HIS capabilities can mediate accountability. First, it shows how the meanings attached to accountability influenced technological innovation by shaping local actors' idea of a functioning HIS. For example, management's internalization of bureaucratic accountability drove the inscription of rules such as SOPs in the HIS design. These rules enabled the decentralization of routines and simple data reporting tasks (Bloom et al., 2014) while allowing the central level to enact structures of domination and keep control over the information collected. In addition, the HIS mediated the constitution of social relations between HIS officers and managers in the Programme of Immunization, which potentially could support the local enactment of bureaucratic accountability. Next, the discussion about DHIS2 provides further examples about the role of HIS in mediating accountability.

### ***The role of DHIS2 capabilities in mediating the tension between bureaucratic and democratic accountability***

The role of IT materiality in mediating socializing forms of accountability was particularly evident in the case of DHIS2 and the enactment of democratic accountability. Like bureaucratic accountability, democratic accountability benefitted from the alignment between structures of domination (resources at county level), legitimation (e.g., legitimacy of monitoring indicators as "part of everyday life"), and signification (belief in the positive impact of information on health service management). In particular, democratic accountability was possible thanks to devolution and the decentralisation of the HIS, which reduced the power distance and increased dialogue among groups of users (e.g., HIS officers and Health Management Teams). DHIS2 mediated socialization among different groups of users by providing unlimited data access and improving data consistency, which, for example, increased medical officers' interest in health information. Thus, DHIS2 participated in the construction of norms and meaning systems (Doolin, 1998, 2003) through which users

valued the use of data in health service management and, potentially, could gain a greater understanding of the health system's and patients' needs.

In addition to democratic accountability, the digital capabilities of DHIS2 could accommodate bureaucratic accountability as well. This was possible thanks to the higher interpretive flexibility (Orlikowski, 1992) of the new computerized system compared to the previous paper-based system. For example, national HIS officers integrated customized reporting forms and quality standards in DHIS2 to dictate how counties should use the software to collect and report data. In this way, national HIS officers could use DHIS2 to enact bureaucratic accountability in order to account for health sector performance at the national level.

Bureaucratic accountability and democratic accountability have different objectives. Whereas the former is about accounting for performance against set targets, the latter aims to account for the needs of health service users (Brinkerhoff 2004). Yet, the case study shows that these objectives should not be in conflict but complement each other. Indeed, dialogue and socialization across the national and lower levels of the health system can ensure that bureaucratic accountability does not hamper democratic accountability.

For example, the case study showed a misalignment between structures of domination/legitimation and structures of signification. Whereas the former sustained bureaucratic accountability at the national level, the latter represented county administrators' view of these indicators as serving the needs of donor agencies rather than the health care needs of their communities. One of the possible causes of this misalignment was national HIS officers' lack of confidence in county administrators' understanding of data to the extent that dialogue between these groups of actors may have been difficult. In addition, the new features of DHIS2 mediated the tension between bureaucratic and democratic accountability by maintaining the power distance between national and county users of the HIS. The consequent lack of socialization between these two groups of users and, in particular, the lack of involvement of county users in the design of monitoring indicators may have jeopardized democratic accountability. Together with the example of enforcement



mechanisms in the Programme of Immunization, these findings stress the importance of a two-way communication system and the presence of both answerability and enforcement mechanisms (Brinkerhoff, 2004) across the national and lower levels of the health system to ensure that information is used to improve the health service.

### ***Implications for the integration of IT materiality within structuration theory***

The first implication of this paper concerns the integration of materiality in a structuration theory perspective. The paper demonstrates how structuration theory is still a useful perspective for studying the linkage between IT materiality and socio-organizational processes and, in particular, for understanding how IS mediate legitimation, power, and meaning structures. One of the assumptions of structuration theory is that actors hold themselves accountable by reflexively monitoring their own and other people's actions to make sure that they conform to socially acceptable behaviours. By focusing on the different *modalities* through which HIS users reproduced structures of domination, legitimation, and signification, this study was able to identify different assumptions by which users interpreted and legitimized accountability. For example, one county officer mentioned how much he valued the use of health information in health service management. Such a view of information can influence the use of HIS to account for health service users' needs in contrast with national HIS officers' use of the HIS to account for health sector performance.

Yet, one criticism of Giddens' structuration theory is that it overlooks how the enduring materiality of IT may affect social structures (Jones & Karsten, 2008). This study addresses this limitation by using Sewell's conceptualization of "allocative resources" as material (Sewell, 1992, 2005) and argues that, in addition to virtual structures, the material features of IT are also implicated in processes of structuration. In particular, this study adopts the notion of interpretive flexibility (Doherty et al., 2006) to show how the material features of a technology can act as the boundaries within which users can interpret a technology while they draw on the social structures of their institutional environment. Under

this perspective, materiality is implicated in processes of structuration by influencing the meanings that users associate with a technology and users' intended use of a technology.

Sociomateriality and the structuration theory perspective developed in this paper are different and can be used to study different aspects of accountability. For example, the focus on sociomaterial practices as a “constitutive entanglement” (Orlikowski & Scott, 2008) can be used to understand how sociomaterial practices, such as “anonymity”, blur the boundaries between users' identities and their material-discursive interactions on social media, which challenges transparency and accountability (S. V. Scott & Orlikowski, 2014). The focus of this paper is on a different aspect of accountability, that is, how IT materiality, and, more specifically, HIS capabilities mediate the enactment and legitimacy of accountability. Answers to this question require a different lens that, as opposed to sociomateriality, does not conflate the material with the social, but considers them as two discrete entities. The critical realist version of sociomateriality (Leonardi, 2013; Mutch, 2013) and its view of the material and social as two distinct entities could serve this purpose if it were not for its lack of conceptualization of social structures. Through the notion of “interpretive flexibility”, the case study shows how the material features of the HIS shape the rules, norms and meanings implicated in the reproduction of social structures that legitimize accountability. For example, DHIS2 mediated the construction of norms and meaning systems (Doolin, 1998, 2003) through which users could gain a greater understanding of the value of data in health service management locally. Therefore, the enduring part of an IT, in this case the capabilities of DHIS2, were implicated in processes of structuration that supported a decentralized use of health information and the consequent enactment of democratic accountability.

### ***Implications for understanding the role of ICT in fostering development***

A second implication of this study concerns the role of flexible web-based technologies in making a difference for development (e.g., Jha, Pinsonneault, & Dubé, 2016; Monteiro & Hanseth, 1996). In particular, this study contributes towards a greater understanding of how

HIS, with a flexible IT design, can foster development by facilitating democratic accountability, i.e., by increasing local decision makers' interests in health information and their ability of valuing and using data to improve the delivery of health services to their citizens. Evidence regarding the use of DHIS2 in the counties demonstrates how the materiality of flexible IT participates in the construction of norms and meaning systems through which users value the use of data. By doing so, flexible IT mediates the socialization among different groups of HIS users, who, potentially, can gain a greater understanding of the challenges of the health system and account for health service users' needs.

This study also contributes to the debate about the role of devolution and decentralized HIS in fostering development (Madon et al., 2010). In particular, it shows how the flexible design of a decentralized HIS can lead to the co-existence of both bureaucratic and democratic accountabilities adding to the complexity of the impact of HIS on health service management. While previous research has stressed the need to balance between centrally controlled and decentralized health care information infrastructures (Rodon & Silva, 2015), the case study illustrated in this paper demonstrates the conflicts that may arise if such a balance is not achieved. In particular, the case of DHIS2 shows how flexible HIS can be re-adapted to serve the interests and information needs of actors at the central level and reproduce structures of domination that favour bureaucratic accountability. These structures might limit the socialization among actors of the health system, which can put democratic accountability at risk and undermine a better use of information to address the health care and development needs of local communities. These findings highlight the complexity of LMICs' contexts for being characterized by power, legitimacy, and meaning structures that are often misaligned and reflect competing accountability goals. Ideally, ICT can foster development by mediating and rebalancing the tension between conflicting social structures and accountabilities. In particular, HIS should be designed in a way that can foster dialogue and socialization across the different levels of the health system so that the goals of bureaucratic and democratic accountabilities are not in conflict but complement each other.

Earlier studies suggest that the use of HIS to promote bureaucratic accountability through the monitoring of national health targets and funding can have controversial effects for development (Ciborra, 2005; Noir & Walsham, 2007). Research attributes such controversial effects to the political nature of ICT4D programmes, particularly when they are meant to “enforce” values that are alien to local contexts (Andrade & Urquhart, 2012; Sahay, Monteiro, & Aanestad, 2009; Walsham & Sahay, 1999). Through the analysis of bureaucratic accountability in the Programme of Immunization, this study adds to this research by showing how the negative development impact of HIS is due to the individualizing effects of bureaucratic accountability (Roberts, 1991) that the tension between formal policy objectives and multiple agencies in LMICs amplify. The challenge for ICT in fostering development is to balance these different agencies, in particular, because of the social nature of accountability whereby interests mediate accountability goals. While the focus of this study was mainly on bureaucratic and democratic accountability in the health sector, there are also social accountabilities that can elude the development impact of ICT (Miscione 2007). Social accountabilities often relate to practices of social protection that hold individuals accountable to their community but that can have negative effects on public health. An example is “widow inheritance” whereby the widow of a man who may have died of AIDS can be inherited by a family or clan member increasing the risk of contagion (Okeyo & Allen, 1994). Further research could investigate how ICT-based mobilization programmes can improve healthcare and development outcomes by mediating the goals and effects of social accountabilities.

### ***Implications for IS and accountability***

Recent IS research has mainly focused on the role of IS in holding people accountable and self-disciplined by making their behaviour more visible (Constantinides, 2011; Doolin, 1998; Vance, Lowry, & Eggett, 2013). This bureaucratic view of accountability as reinforcing norms of control is contrasted with a socializing form of accountability (Roberts, 1991) where actors socially construct accountability in relation to their interests (Anifalaje, 2012) and enact

accountability through social acts and learning encounters (Madon & Krishna, 2017). The IS literature has overlooked such a socializing form of accountability and has mainly focused on the individualizing effects of accountability. This study fills this gap by showing how IS can mediate the socializing effects of accountability.

As shown in the case study, there can be different interpretations of accountability. For example, in the context of healthcare some actors may interpret accountability as a way to account for resources and performance, others may interpret it as a way to account for patients' needs. IS contributes to the construction of social relations among actors and mediates the norms and meaning systems through which users understand what accountability involves, and share and negotiate accountability goals.

This study also found that the interests of different groups of actors, such as HIS officers and managers in the Programme of Immunization, influence the enactment of accountability. Thus, a system design meant to enhance the perception of accountability (Vance et al., 2013) may work for some users but not for others. By showing how IS can mediate the interests and meanings actors associate with accountability, this study contributes to a greater understanding of how IS can rebalance multiple organizational and professional accountabilities (Yekel, 2001). A closer look at how IS mediate the social construction of accountability can explain, for example, why some health care professionals are likely to accept the use of IS to monitor their performance more than others (Doolin, 2004; Gabe, Exworthy, Jones, & Smith, 2012; Wainwright & Waring, 2007).

Another implication of this study concerns the role of IS as an "answerability mechanism" (Brinkerhoff, 2004) that supplies information about employees' performance and, thereby, contributes to making employees' work more visible and subject to management's control (Roberts, 1991). The case study suggests that the use of IS as answerability mechanisms might contribute to distorted representations of performance (Vieira da Cunha et al., 2015). Future research should investigate how enforcement and feedback mechanisms could be better integrated in the use of IS in order to ensure that information is actually used to improve performance. Performance management could be

more effective if organizations used IS as a means of socialization and learning (V. E. Scott, 2015) to enact “accountability for improvement” instead of “accountability for control” (Brinkerhoff, 2004).

## Conclusion

This study draws on structuration theory to understand how accountability acquires legitimacy and becomes enacted locally. The case study analysed in this paper reveals the role of social structures, such as norms, meaning systems, and resources, in mediating users’ interpretation and legitimation of accountability. Through this process of legitimation, local actors attach meanings to accountability, which, in turn, influence their representation of how the HIS should be designed and used. An important implication of the findings illustrated in this paper concerns the role of materiality in processes of structuration and, in particular, how HIS capabilities mediate the enactment of accountability. In addition, this study considers HIS not just as a means for controlling performance but also as a means of socialization through which health care authorities and providers can account for the needs of health service users. This study acknowledges the complexity of HIS characterised by centralized and decentralized forms of governance (Rodon & Silva, 2015) and the challenge for HIS to mediate among competing accountability goals.

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